Past Catalyst Grant winners

Enhancing Recovery from Post-Stroke Depression
PROJECT LEADERS: Dr. Paul Albert, Ottawa Hospital Research Institute; Dr. Diane Lagace, University of Ottawa
COLLABORATORS: Dr. Dale Corbett, University of Ottawa
Depression is common after stroke: approximately a third of people experience depression within the first year following stroke and, of those, 80% have a mild form of the disease. Depression is associated with poorer recovery, poorer quality of life, reduced autonomy, and greater risk of suicide. CPSR research is probing how exercise and anti-depressants — in combination and alone — can repair the brain and reduce post-stroke depression in a laboratory model. Results from this study will provide important insights into the brain mechanisms associated with depression in stroke recovery and will lead to better development of treatments for post-stroke depression.

Development of an Inpatient Stroke Rehabilitation Clinical Trials Network
PROJECT LEADERS: Dr. Sean Dukelow, University of Calgary Dr. Janice Eng, University of British Columbia
COLLABORATORS: Dr. Mark Bayley, Toronto Rehab; Dr. Michael Hill, University of Calgary
There is increasing evidence that exercise intensity is the key to better recovery after stroke. The objective of this national project is to establish a multi-site network to investigate the impact of different 'doses' of exercise on walking and cognition (reasoning, decision-making, memory, understanding, etc) during the critical early stage after stroke. The results will help change the delivery of rehabilitation care to improve recovery for stroke patients around the world.

The Role of Microglia in Promoting Exercise-Induced Enhanced Recovery Following a Stroke
PROJECT LEADERS: Dr. Hsiao-Huei Chen, Ottawa Hospital Research Institute; Dr. Diane Lagace, University of Ottawa
This project looks at the impact of exercise on cells in the brain during stroke recovery in a laboratory model and how cellular changes promote brain repair. Better understanding of cellular changes will provide new insight into how exercise might be optimized to promote brain recovery.

Investigating Treatment-Induced Plasticity After Aphasia Therapy
PROJECT LEADERS: Dr. Carol Leonard, University of Ottawa; Dr. Jed Meltzer, Baycrest; Dr. Elizabeth Rochon, Toronto Rehab-UHN
COLLABORATORS: Dr. Karine Marcotte, Universite de Montreal; Dr. Ana Inés Ansaldo, Universite de Montreal
Up to 40% of people who have a stroke experience aphasia — problems communicating or understanding language. Therapies are available to help people with language loss to retrieve names of pictures, objects or actions in their everyday speech. What is not clear is what is the optimal intensity to maximize benefit, or what are the brain changes that occur following treatment. Using advanced imaging technology, changes in the brain are being examined pre- and post-therapy (including two different therapy intensities) to increase understanding of the brain's language network and its potential for recovery. Findings will lead to better therapies to improve communication after stroke.

Perception of Egocentric Vertical Among Stroke Survivors with and without "Pushing"
PROJECT LEADERS: Dr. Avril Mansfield, Toronto Rehab; Dr. Jennifer Campos, University of

Toronto
COLLABORATORS: Dr. Laurence Harris, York University; Babak Taati, Toronto Rehab; and Cynthia Danells, Sunnybrook Research Institute
Up to two-thirds of people who have an acute stroke find themselves leaning (therapists call it 'pushing') into their weak side, a counterintuitive puzzling phenomenon causing balance problems. Sometimes the condition is so severe they can't sit or stand well enough to begin rehabilitation. This project uses virtual reality and motion simulation to identify the visual, postural and perceptual factors that cause these balance difficulties. Results of this research will lead to the development of new rehabilitation therapies.

Exploring Potential Synergistic Effects of Aerobic and Cognitive Exercise on Cognition after Stroke: A multi-site pilot RCT
PROJECT LEADERS: Dr. Jason McCarthy, Memorial University of Newfoundland; Dr. Michelle Ploughman, Memorial University of Newfoundland.
Following stroke, up to 70 per cent of people experience problems in cognition -the way they think, concentrate, understand, remember, form new ideas and evaluate actions. These cognitive changes interfere with physical recovery and a patient's response to rehabilitation. This project tests a 'combination approach' of treadmill exercise and computer-based memory exercises to improve cognition after stroke. It will determine if the combination works better than one approach alone and will lead to new rehabilitation strategies.

Evaluation of an Intelligent Haptic Robotic Rehabilitation System to Improve Upper-Limb Recovery Post-Stroke
PROJECT LEADERS: Dr. Alex Mihailidis, University of Toronto/Toronto Rehab; Dr. William McIlroy, University of Waterloo/Toronto Rehab.
COLLABORATORS: Dr. Walter Wodchis, UofT/Toronto Rehab; Dr. Debbie Hebert, Toronto Rehab; Dr. Rosalie Wong, Toronto Rehab; Dr. Rajibul Huq, Toronto Rehab.
Using robotics to aid rehabilitation after stroke shows promise to improve physical function but the costs for these devices are typically prohibitively high. Researchers at Toronto Rehab have developed a low-cost, table-top robot to deliver therapy that strengthens arms weakened by stroke. They have set up the first-ever Robotic Stroke Rehab Clinic and, with funding from CPSR, the system, which uses games to encourage participation, is being evaluated for future rollout of a large multi-site clinical trial. Research will determine if this approach is cheaper and more effective than typical stroke therapy.

Customizing Novel Virtual Rehabilitation Exercises To The Specific Physical Limitations of Individual Stroke Survivors
PROJECT LEADERS: Dr. Babak Taati, Toronto Rehab-UHN; Dr. Jennifer Campos, Toronto Rehab-UHN.
Weakness on one side of the body after stroke severely limits the ability for people to perform everyday activities. Researchers are building a computer-vision system to deliver rehabilitation therapy in a virtual environment based on a combination of two research-proven treatments ('Mirror Box Therapy' and 'Rubber Hand Illusion'). This system provides feedback to stroke patients about the movement of their affected arms and uses artificial intelligence to customize exercises to individual limitations. CPSR funding is supporting the development and testing of this innovative new technology.

Effects of Combined Resistance and Aerobic Training versus Aerobic Training Alone on Cognition and Mobility following Stroke (RAvA)
PROJECT LEADERS: Dina Brooks and Paul Oh (TRI-UHN)

Impact of "Exercise Mimetics" that Modulate Skeletal Muscle Phenotype on Brain Repair and Recovery Following Focal Ischemic Stroke
PROJECT LEADER: Bernard Jasmin (uOttawa)

Defining the Neural Circuits Underlying Exercise Interventions in Stroke Recovery
PROJECT LEADER: Diane Lagace (uOttawa)

Exploring the Impact of a Community-Based Exercise Program on Physical Function, Participation and Caregiver Health among People with Stroke and their Caregivers
PROJECT LEADER: Nancy Salbach (TRI-UHN)

Use of eLearning methods to evaluate best practice application of AEROBICS guidelines by physiotherapists within the Champlain Regional Stroke Network: A pilot study [Top Ranked Grant – Winner of Hakim Award]
PROJECT LEADERS: Marianne Thornton (OHRI) and Marilyn MacKay-Lyons (Dalhousie)

Characterizing the Impact of Silent Lesions on Stroke Recovery Using Multimodal Neuroimaging
PROJECT LEADER: Dr. Lara Boyd, University of British Columbia
COLLABORATOR: Dr. Richard Staines, University of Waterloo
Research shows that changes in cognition (the way people think, remember and understand) affect recovery from stroke and quality of life. Approximately 50% of people living with stroke have some form of cognitive impairment and it is thought that the presence of undetected damage to small blood vessels in the brain (called "silent" lesions) is a factor. CPSR researchers are using sophisticated brain imaging technology to determine if the number and location of these so-called "silent" lesions are the cause of the cognitive changes. Findings will lead to the development of new therapies to treat small vessel disease and improve health and quality of life after stroke.

Cognitive Assessment in Stroke: The Ontario Health Study Computerized Battery
PROJECT LEADERS: Dr. Brian Levine, Baycrest; Dr. Sandra Black, Sunnybrook Research Institute
COLLABORATORS: Dr. Herve Abdi, University of Texas at Dallas; Dr. Derek Beaton, University of Texas at Dallas; Dr. Adam Hampshire, University of Western Ontario; Dr. Adrian Owen, University of Western Ontario; Dr. Mary Pat McAndrews, Toronto Western Hospital-UHN; Dr. Nicole Anderson, Rotman Research Institute, Baycrest
As part of the Ontario Health Study, researchers created a computerized screening tool that tests cognitive function (memory, reasoning, problem-solving). The new 30-minute test will replace costly, time-consuming and outdated methods. CPSR funding is being used to validate the tool for assessing stroke-related cognitive decline and will lead to the refinement of this indispensible tool for tracking changes after stroke and for monitoring recovery. The tool could be much more widely used in stroke clinics where there are little or no neuropsychological services.

Contrasting Modes of Plasticity and Brain Stimulation after Focal Ischemia or Vascular Dementia Models
PROJECT LEADERS: Dr. Tim Murphy, University of British Columbia
COLLABORATORS: Dr. Jean-Claude Béïque, University of Ottawa; Dr. Richard Staines, University of Waterloo
Researchers are studying laboratory models to gain insight into the changes in the brain after stroke versus vascular dementia. Research will closely examine and compare the spontaneous

recovery that occurs following these two types of 'vascular injuries' and how the brain responds to different kinds of stimulation. New knowledge of how the brain forms networks (scientists refer to it as 'neuroplasticity') following stroke compared to vascular dementia will lead to the development of different approaches to rehabilitation.

The hidden risk factor: small vessel disease and vascular remodelling in AD
PROJECT LEADER: Bojana Stefanovic (Sunnybrook)

Improving Insulin Signaling to Enhance Functional Recovery from Stroke by Promoting AMPA Receptor Trafficking and Synaptic Plasticity
PROJECT LEADERS: Dr. Hsiao-Huei Chen, Ottawa Hospital Research Institute; Dr. Jean-Claude Béïque, University of Ottawa.
COLLABORATORS: Dr. Diane Lagace, University of Ottawa
People with Type 2 diabetes have a higher risk of stroke with poor recovery. This CPSR study in diabetic rodents will determine how to better regulate insulin in the brain to enhance brain repair, learning and memory. The goal is to gain new knowledge that will eventually help in the development of better drugs to improve recovery after stroke in individuals with diabetes.

The Role Of WNT7A in Neuroplasticity and Post-Stroke Recovery
PROJECT LEADERS: Dr. Dale Corbett, University of Ottawa; Dr. Michael Rudnicki, Ottawa Hospital Research Institute
COLLABORATOR: Dr. Diane Lagace, University of Ottawa
Better understanding of the cellular and molecular mechanisms underlying regulation of brain stems cells (immature cells in the brain that can morph into specialized brain cells) holds promise as a therapy to improve stroke recovery. CPSR research in a rodent model is investigating the potential of a key protein (called Wnt7a) to promote brain stem cell development and improve stroke recovery. Results could reveal breakthroughs in understanding brain repair and rewiring ("neuroplasticity") and lead to the development of highly targeted drugs to activate stem cells, particularly for severe strokes where rehabilitation provides minimal benefit.

The Effect Of Rehabilitative Training on the Reorganization of the Contralesional Cortex Following Ischemic Lesions in the Rat
PROJECT LEADERS: Dr. Numa Dancause, Université de Montréal
COLLABORATOR: Dr. Dale Corbett, University of Ottawa
How do rehabilitation programs help to reorganize the damaged part of the brain? How do they affect the undamaged part of the brain, which is opposite the stroke? How does brain reorganization help to strengthen weakened limbs? Research in rodents is expected to provide new insights and valuable data into rehabilitation and brain recovery. Findings will help in the design of better rehab therapies.

Elucidating the Underlying Mechanisms of Disordered Upper Limb Function in Stroke: The Relationship Between Deficits in Trunk Control and Upper Limb Coordination
PROJECT LEADERS: Dr. Mindy Levin, McGill University; Dr. Dorothy Barthelemy, Universite de Montreal; Dr. Anatol Feldman, Universite de Montreal; Dr. Heidi Sveistrup, University of Ottawa; Dr. Martin Bilodeau, University of Ottawa
COLLABORATOR: Dr. Hillel Finestone, Elisabeth Bruyere Research Institute
Up to two-thirds of people who have a stroke lose some function in one of their arms. A major issue in stroke rehab is determining the most effective therapies to regain arm use. This CPSR study is looking at the physical links between torso control, coordination of torso-arm movement, and reaching. Findings will lead to the development of better diagnostic tests, better therapies

and a better ability to track arm recovery.

The Role of PINK1 in NPC Survival Following Stroke
PROJECT LEADERS: Dr. David Park, University of Ottawa; Dr. Ruth Slack, University of Ottawa
COLLABORATOR: Dr. Diane Lagace, University of Ottawa.
One promising strategy to promote stroke recovery is to enhance the natural ability of the brain to generate new neurons (brain cells) by converting immature cells located in the brain into specialized brain cells. By learning to enhance this ability, the brain could respond to stroke injury and to repair brain damage. Researchers are studying factors in cell health and cell survival to understand why some cells die and what inhibits development of new neurons. Insight will lead to the discovery of ways to improve cell survival and, in turn, boost stroke recovery.

Examining the Benefits of the Spacing Effect to Memory Rehabilitation and Neural Organization in Stroke Patients
PROJECT LEADERS: Dr. Shayna Rosenbaum, York University/Baycrest; Dr. Gordon Winocur, Baycrest
COLLABORATORS: Dr. Sandra Black, Sunnybrook; Dr. Patrick Davidson, University of Ottawa; Dr. Sylvain Moreno, Baycrest; Dr. Melody Wiseheart, York University.
People often have memory problems after stroke. CPSR researchers are evaluating whether the "spacing effect", an established technique to improve memory through repetition, is also beneficial for stroke patients. Imaging (MRI) will determine which specific mechanisms support memory improvement in the brain and provide valuable insight into brain reorganization and cognitive recovery. New understanding will lead to the development of evidence-based practices to improve memory in stroke patients.

Preclinical Testing of Probenecid for Stroke Recovery Treatment
PROJECT LEADERS: Dr. Leigh Anne Swayne, University of Victoria
COLLABORATORS: Dr. Diane Lagace, University of Ottawa
CPSR researchers are conducting preclinical testing of an approved anti-gout drug ("probenecid") that could be beneficial in helping the brain recover after stroke. They will measure brain rewiring ("neuroplasticity") and recovery in rodents with stroke, and measure changes in the brain and behavior at one week and one month after stroke. The goal is to find new drug treatments for stroke recovery, and if this study is successful, findings could be translated relatively quickly to a clinical trial since the drug has already been approved for use in humans.

Combining Survival Signaling in Neuroblasts with Enriched Rehabilitation to Effect Neural Repair Following a Focal Ischemic Injury in the Mouse
PROJECT LEADERS: Dr. Jacqueline Vanderluit, Memorial University of Newfoundland; Dr. Karen Mearow, Memorial University of Newfoundland
COLLABORATOR: Dr. Dale Corbett, University of Ottawa
It is well established that immature brain cells react to stroke by dividing, moving to the area of brain damage and converting to specialized brain cells. However, the vast majority of these cells die before completing their mission. A target of basic science research is finding ways to help new brain cells survive and move to the area of stroke damage in order to repair lost tissue. CPSR researchers are studying in mice a technique to activate cell production in combination with rehabilitation in an "enriched" environment (where there is a lot of stimulation, e.g., new objects, activities and tasks). The goal is to determine if this combination approach leads to improved survival of new brain cells, tissue repair and better recovery after stroke.

Direct Visualization of axonal projections during stroke recovery
PROJECT LEADER: Jean-Claude Béïque (uOttawa)

Stimulating endogenous brain repair to promote cognitive recovery following neonatal hypoxia-ischemia
PROJECT LEADER: Dale Corbett (uOttawa)

Stimulating neurogenesis and plasticity to enhance recovery in a rat model of focal stroke
PROJECT LEADER: Kullervo Hynynen (Sunnybrook)

A System for Automatic Lesion Delineation, with Application to Prediction of Recovery from Stroke and Treatment Efficacy
PROJECT LEADER: Stephen Strother (Baycrest, RRI)